Report for ForestQuery into Global Deforestation, 1990 to 2016

ForestQuery is on a mission to combat deforestation around the world and to raise awareness about this topic and its impact on the environment. The data analysis team at ForestQuery has obtained data from the World Bank that includes forest area and total land area by country and year from 1990 to 2016, as well as a table of countries and the regions to which they belong.

The data analysis team has used SQL to bring these tables together and to query them in an effort to find areas of concern as well as areas that present an opportunity to learn from successes.

## 1. **GLOBAL SITUATION**

According to the World Bank, the total forest area of the world was **41282694.9** in 1990. As of 2016, the most recent year for which data was available, that number had fallen to **39958245.9**, a loss of **1324449**, or **3.21%.**

The forest area lost over this time period is slightly more than the entire land area of **Peru** listed for the year 2016 (which is  **1279999.99**).

## 2. **REGIONAL OUTLOOK**

In 2016, the percent of the total land area of the world designated as forest was **31.38%**. The region with the highest relative forestation was **Latin America & Caribbean** with **46.16%**, and the region with the lowest relative forestation was **Middle East & North Africa**, with **2.07%** forestation.

In 1990, the percent of the total land area of the world designated as forest was **32.42%**. The region with the highest relative forestation was **Latin America & Caribbean**, with **51.03%**, and the region with the lowest relative forestation was **Middle East & North Africa**, with **1.78%** forestation.

Table 2.1: Percent Forest Area by Region, 1990 & 2016:

| Region | 1990 Forest Percentage | 2016 Forest Percentage |
| --- | --- | --- |
| East Asia & Pacific | 25.7760953973175 | 26.3586765000485 |
| Europe & Central Asia | 37.2839398564019 | 38.0414216032517 |
| Latin America & Caribbean | 51.0299798667514 | 46.1620721996047 |
| Middle East & North Africa | 1.77524062469353 | 2.06826486871501 |
| North America | 35.6511790009015 | 36.0393609681438 |
| South Asia | 16.510767001421 | 17.5058634081534 |
| Sub-Saharan Africa | 30.6741454610006 | 28.7881883550464 |
| World | 32.4222035575689 | 31.3755709643095 |

The only regions of the world that decreased in percent forest area from 1990 to 2016 were Latin **America & Caribbean** (dropped from **51.03%** to **46.17%**) **and Sub-Saharan Africa** (**30.67%** to **28.79%**). All other regions actually increased in forest area over this time period. However, the drop in forest area in the two aforementioned regions was so large, the percent forest area of the world decreased over this time period from **32.42%** to **31.38%.**

## 3. **COUNTRY-LEVEL DETAIL**

### SUCCESS STORIES

There is one particularly bright spot in the data at the country level, **China**. This country actually increased in forest area from 1990 to 2016 by **527229.06**. It would be interesting to study what has changed in this country over this time to drive this figure in the data higher. The country with the next largest increase in forest area from 1990 to 2016 was the **United States**, but it only saw an increase of **79200**, much lower than the figure for **China.**

**China** and **United States** are of course very large countries in total land area, so when we look at the largest *percent* change in forest area from 1990 to 2016, we aren’t surprised to find a much smaller country listed at the top. **Iceland** Increased in forest area by **213.66%** from 1990 to 2016.

### LARGEST CONCERNS

Which countries are seeing deforestation to the largest degree? We can answer this question in two ways. First, we can look at the absolute square kilometer decrease in forest area from 1990 to 2016. The following 3 countries had the largest decrease in forest area over the time period under consideration:

Table 3.1: Top 5 Amount Decrease in Forest Area by Country, 1990 & 2016:

| Country | Region | Absolute Forest Area Change |
| --- | --- | --- |
| Brazil | Latin America & Caribbean | -541510 |
| Indonesia | East Asia & Pacific | -282193.9844 |
| Myanmar | East Asia & Pacific | -107234.0039 |
| Nigeria | Sub-Saharan Africa | -106506.00098 |
| Tanzania | Sub-Saharan Africa | -102320 |

The second way to consider which countries are of concern is to analyze the data by percent decrease.

Table 3.2: Top 5 Percent Decrease in Forest Area by Country, 1990 & 2016:

| Country | Region | Pct Forest Area Change |
| --- | --- | --- |
| Togo | Sub-Saharan Africa | -75.4452559270073 |
| Nigeria | Sub-Saharan Africa | -61.7999309388418 |
| Uganda | Sub-Saharan Africa | -59.1286034729531 |
| Mauritania | Sub-Saharan Africa | -46.7469879518072 |
| Honduras | Latin America & Caribbean | -45.0344149459194 |

When we consider countries that decreased in forest area percentage the most between 1990 and 2016, we find that four of the top 5 countries on the list are in the region of **Sub-Saharan Africa**. The countries are **Togo, Nigeria, Uganda, and Mauritania**. The 5th country on the list **isHonduras**, which is in the **Latin America & Caribbean** region.

From the above analysis, we see that **Nigeria** is the only country that ranks in the top 5 both in terms of absolute square kilometer decrease in forest as well as percent decrease in forest area from 1990 to 2016. Therefore, this country has a significant opportunity ahead to stop the decline and hopefully spearhead remedial efforts.

### QUARTILES

Table 3.3: Count of Countries Grouped by Forestation Percent Quartiles, 2016:

| Quartile | Number of Countries |
| --- | --- |
| 0-25% | 85 |
| 25-50% | 73 |
| 50-75% | 38 |
| 75-100% | 9 |

The largest number of countries in 2016 were found in the **1s (0-25%)** quartile.

There were 9 countries in the top quartile in 2016. These are countries with a very high percentage of their land area designated as forest. The following is a list of countries and their respective forest land, denoted as a percentage.

Table 3.4: Top Quartile Countries, 2016:

| Country | Region | Pct Designated as Forest |
| --- | --- | --- |
| American Samoa | East Asia & Pacific | 87.5000875000875 |
| Micronesia, Fed. Sts. | East Asia & Pacific | 91.8572390715248 |
| Gabon | Sub-Saharan Africa | 90.0376418700565 |
| Guyana | Latin America & Caribbean | 83.9014489110682 |
| Lao PDR | East Asia & Pacific | 82.1082317640861 |
| Palau | East Asia & Pacific | 87.6068085491204 |
| Solomon Islands | East Asia & Pacific | 77.8635177945067 |
| Suriname | Latin America & Caribbean | 98.2576939676578 |
| Seychelles | Sub-Saharan Africa | 88.4111367385789 |

## 4. RECOMMENDATIONS

*Write out a set of recommendations as an analyst on the ForestQuery team.*

* *What have you learned from the World Bank data?*

Forests are gradually diminishing worldwide. Data analysis from 1990 to 2016 highlights a significant reduction in global forest cover, with Sub-Saharan Africa being the most affected region. For instance, Togo experienced a drastic forest reduction of 75.45%. Furthermore, an examination of forestation percentages reveals a concerning trend: 85 countries fall within the lowest quartile, having less than 25% forest cover, while 72 countries are in the second quartile, with forestation levels ranging from 25% to 50%.

* *Which countries should we focus on over others?*

Four out of the five countries experiencing the largest percentage decreases in forest cover are in Sub-Saharan Africa. During the period from 1990 to 2016, Togo saw over a 75% reduction in its forests. Other countries with significant losses include Nigeria (61.80%), Uganda (59.13%), and Mauritania (46.75%). It is crucial to recognize that our current lifestyle contributes to an unsustainable ecological footprint. Several measures can be implemented to mitigate this impact. First, reducing consumption can directly slow down the rate of deforestation. Second, avoiding products containing palm oil, which is a major driver of deforestation, particularly in Asia. Lastly, opting for sustainably certified products can promote environmentally responsible practices.

## 5. APPENDIX: SQL Queries Used

-- create view data

CREATE VIEW view\_forestation AS

SELECT

fa.country\_code,

fa.country\_name,

fa.year,

fa.forest\_area\_sqkm,

la.total\_area\_sq\_mi,

la.total\_area\_sq\_mi \* 2.59 AS total\_area\_sqkm,

re.region,

re.income\_group,

(fa.forest\_area\_sqkm / (la.total\_area\_sq\_mi \* 2.59)) \* 100 AS percent\_forestation

FROM

forest\_area fa

JOIN

land\_area la ON fa.country\_code = la.country\_code AND fa.year = la.year

JOIN

regions re ON re.country\_code = fa.country\_code;

-- GLOBAL SITUATION

SELECT year, SUM(forest\_area\_sqkm) AS total\_forest\_area

FROM view\_forestation

WHERE year IN (1990, 2016)AND region = 'World'

GROUP BY year;

WITH ForestData AS (

SELECT

year,

SUM(forest\_area\_sqkm) AS total\_forest\_area

FROM

view\_forestation

WHERE

year IN (1990, 2016)

AND region = 'World'

GROUP BY

year

)

SELECT

fa1990.total\_forest\_area AS forest\_area\_1990,

fa2016.total\_forest\_area AS forest\_area\_2016,

(fa1990.total\_forest\_area - fa2016.total\_forest\_area) AS forest\_area\_difference,

((fa1990.total\_forest\_area - fa2016.total\_forest\_area) / fa1990.total\_forest\_area) \* 100 AS percent\_change

FROM

ForestData fa1990,

ForestData fa2016

WHERE

fa1990.year = 1990

AND fa2016.year = 2016;

SELECT

country\_name,

( total\_area\_sq\_mi \* 2.59 ) AS total\_area\_sqkm

FROM

view\_forestation

WHERE

year = 2016

ORDER BY

total\_area\_sqkm;

-- 2. REGIONAL OUTLOOK

SELECT

percent\_forestation

FROM

view\_forestation

WHERE

year = 2016

AND country\_name = 'World';

SELECT

percent\_forestation

FROM

view\_forestation

WHERE

year = 1990

AND country\_name = 'World';

WITH ForestationData AS (

SELECT

year,

region,

SUM(forest\_area\_sqkm) AS total\_forest\_area,

SUM(total\_area\_sqkm) AS total\_land\_area,

(SUM(forest\_area\_sqkm) / SUM(total\_area\_sqkm)) \* 100 AS percent\_forestation

FROM

view\_forestation

WHERE

year IN (1990, 2016)

GROUP BY

year, region

)

SELECT

year,

region,

total\_forest\_area,

total\_land\_area,

percent\_forestation

FROM

ForestationData;

WITH ForestationData AS (

SELECT

year,

region,

SUM(forest\_area\_sqkm) AS total\_forest\_area,

SUM(total\_area\_sqkm) AS total\_land\_area,

(SUM(forest\_area\_sqkm) / SUM(total\_area\_sqkm)) \* 100 AS percent\_forestation

FROM

view\_forestation

WHERE

year IN (1990, 2016)

GROUP BY

year, region

)

-- Highest forestation in 1990 and 2016

SELECT

year,

region,

percent\_forestation

FROM

ForestationData

WHERE

year IN (1990, 2016)

ORDER BY

year,

percent\_forestation DESC;

-- Lowest forestation in 1990 and 2016

WITH ForestationData AS (

SELECT

year,

region,

SUM(forest\_area\_sqkm) AS total\_forest\_area,

SUM(total\_area\_sqkm) AS total\_land\_area,

(SUM(forest\_area\_sqkm) / SUM(total\_area\_sqkm)) \* 100 AS percent\_forestation

FROM

view\_forestation

WHERE

year IN (1990, 2016)

GROUP BY

year, region

)

SELECT

year,

region,

percent\_forestation

FROM

ForestationData

WHERE

year IN (1990, 2016)

ORDER BY

year,

percent\_forestation ASC;

-- 3. COUNTRY-LEVEL DETAIL

WITH ForestAreaChange AS (

SELECT

fa1990.country\_name,

fa1990.forest\_area\_sqkm AS forest\_area\_1990,

fa2016.forest\_area\_sqkm AS forest\_area\_2016,

(fa2016.forest\_area\_sqkm - fa1990.forest\_area\_sqkm) AS forest\_area\_change

FROM

view\_forestation fa1990

JOIN

view\_forestation fa2016 ON fa1990.country\_code = fa2016.country\_code

WHERE

fa1990.year = 1990 AND fa2016.year = 2016

)

SELECT

country\_name,

forest\_area\_change

FROM

ForestAreaChange

WHERE

forest\_area\_change > 0

ORDER BY

forest\_area\_change DESC

LIMIT 2;

SELECT

curr.country\_name,

100.0 \* (curr.forest\_area\_sqkm - prev.forest\_area\_sqkm) / prev.forest\_area\_sqkm AS percentage\_increase

FROM

forest\_area AS curr

JOIN

forest\_area AS prev ON curr.country\_code = prev.country\_code

AND curr.year = 2016

AND prev.year = 1990

WHERE

curr.forest\_area\_sqkm > prev.forest\_area\_sqkm -- Ensures only positive increases are calculated

ORDER BY

percentage\_increase DESC;

-- Table 3.1: Top 5 Amount Decrease in Forest Area by Country, 1990 & 2016:

SELECT

curr.country\_name,

r.region,

curr.forest\_area\_sqkm - prev.forest\_area\_sqkm AS difference

FROM

forest\_area AS curr

JOIN forest\_area as prev ON ( curr.year = '2016'

AND prev.year = '1990' )

AND curr.country\_name = prev.country\_name

JOIN regions as r ON r.country\_code = curr.country\_code

WHERE prev.country\_name != 'World'

ORDER

by difference limit 5;

-- The second way to consider which countries are of concern is to analyze the data by percent decrease.

SELECT

curr.country\_name,

r.region,

100.0 \* ( curr.forest\_area\_sqkm - prev.forest\_area\_sqkm ) / prev.forest\_area\_sqkm AS percentage

FROM

forest\_area AS curr

JOIN forest\_area as prev ON ( curr.year = '2016'

AND prev.year = '1990' )

AND curr.country\_name = prev.country\_name

JOIN regions as r ON r.country\_code = curr.country\_code

ORDER

by percentage limit 5;

SELECT

quartiles,

COUNT(\*) AS count

FROM (

SELECT

country\_name,

CASE

WHEN percent\_forestation <= 25 THEN '0-25%'

WHEN percent\_forestation <= 50 THEN '25%-50%'

WHEN percent\_forestation <= 75 THEN '50%-75%'

ELSE '75%-100%'

END AS quartiles

FROM

view\_forestation

WHERE

percent\_forestation IS NOT NULL

AND year = 2016

) AS sub

GROUP BY

quartiles;

SELECT

v.country\_name,

r.region,

v.percent\_forestation

FROM

view\_forestation v

JOIN regions r on r.country\_code = v.country\_code

WHERE

v.percent\_forestation > 75

AND year = 2016;